YMC PB-0058E

For all chromatographers 35th anniversary

# YMC CHIRAL

## Polysaccharide Derivatives Series

### HPLC Column / Packing Material with Polysaccharide Derivatives Chiral Selector

- Applicable to various chiral compounds
- Excellent resolution/durability
- Extremely low initial cost on analysis and purification


YMC CO., LTD.
http://www.ymc.co.jp

HPLC Column / Packing Material with Polysaccharide Derivatives Chiral Selector

# YMC CHIRAL
## Polysaccharide Derivatives Series

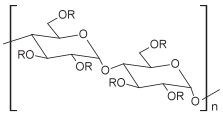
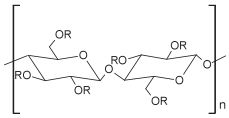
**Features**

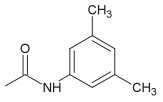
- Applicable to various chiral compounds
- Excellent resolution/durability
- Extremely low initial cost on analysis and purification
- High durability column that is suitable for SFC/SMB


Bulk packing material is also available.

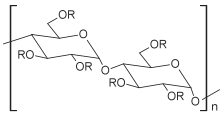
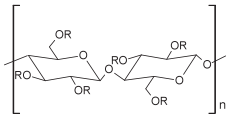
## Specifications

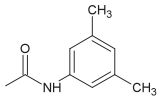
### Coated type

| Column/Packing material | Particle size*1 (μm) | Chiral selector | USP Classification |
|---|---|---|---|
| YMC CHIRAL Amylose-C | 5<br>10<br>20 |  <br>Amylose tris(3,5-dimethylphenylcarbamate) | L51 |
| YMC CHIRAL Cellulose-C | |  <br>Cellulose tris(3,5-dimethylphenylcarbamate) | L40 |
| Usable mobile phase*3 | *n*-hexane, *n*-heptane, ethanol, 2-propanol, acetonitrile, etc. | | |


R:
3,5-Dimethylphenylcarbamate

### Immobilized type*2

| Column/Packing material | | Particle size*1 (μm) | Chiral selector | USP Classification |
|---|---|---|---|---|
| YMC CHIRAL Amylose-SA | | 5<br>10<br>20 |  <br>Amylose tris(3,5-dimethylphenylcarbamate) | — |
| YMC CHIRAL Cellulose-SB | | |  <br>Cellulose tris(3,5-dimethylphenylcarbamate) | — |
| Usable mobile phase*3 | Normal phase | *n*-hexane, *n*-heptane, methanol, ethanol, 2-propanol, acetonitrile, ethyl acetate, tetrahydrofuran, chloroform, *t*-butyl methyl ether, etc. | | |
| | Reversed phase | acetonitrile, methanol, ethanol, 2-propanol, tetrahydrofuran, water, aqueous buffer, etc. | | |


R:
3,5-Dimethylphenylcarbamate

*1 Please inquire us other than those listed above.
*2 Other immobilized type products will be launched.
*3 Please also refer to the instruction manual available on our website.

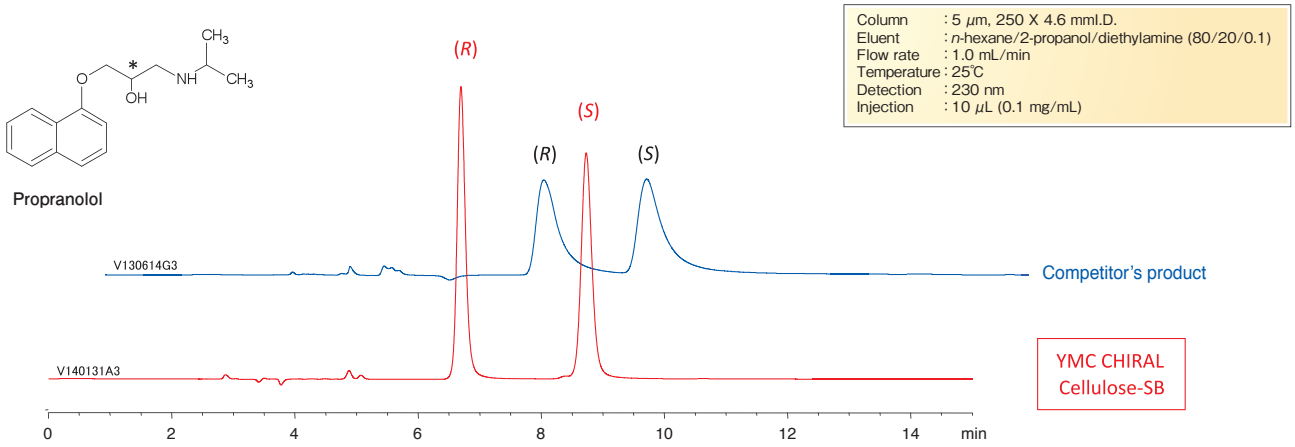
## Useful for Chiral Separation of Wide Range of Compounds

| Compound | Mobile phase | Separation factor (α) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Coated type | | | | Immobilized type | | | |
| | | Amylose-C | Competitor's product | Cellulose-C | Competitor's product | Amylose-SA | Competitor's product | Cellulose-SB | Competitor's product |
| *trans*-Stilbene oxide | Hex/IPA (90/10) | 2.9 | 3.0 | 2.3 | 2.2 | 2.7 | 2.8 | 1.6 | 1.9 |
| Benzoin | Hex/IPA (90/10) | 1.3 | 1.3 | 1.6 | 1.6 | 1.2 | 1.2 | 1.4 | 1.4 |
| *N*-CBZ-DL-Alanine | Hex/IPA/TFA (80/20/0.1) | 2.0 | 2.2 | 3.0 | 2.9 | 1.7 | 1.7 | 1.7 | 1.8 |
| Ibuprofen | Hex/IPA/TFA (99/1/0.1) | 1.1 | 1.1 | 1.3 | 1.2 | 1.1 | 1.1 | 1.1 | 1.1 |
| Propranolol | Hex/IPA/DEA (80/20/0.1) | × | × | 2.0 | 1.8 | × | × | 1.6 | 1.4 |
| Verapamil | Hex/IPA/DEA (90/10/0.1) | 1.3 | 1.3 | × | × | 1.2 | 1.2 | × | × |

Hex: *n*-hexane、IPA: 2-propanol、TFA: trifluoroacetic acid、DEA: diethylamine、×: Not separated

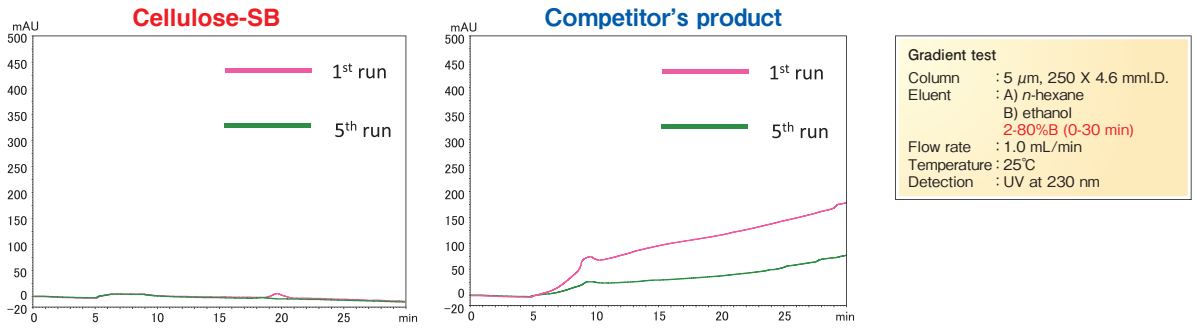
YMC Chiral Polysaccharide Derivatives Series provide results comparable to other polysaccharide columns.

## Excellent Peak Shape



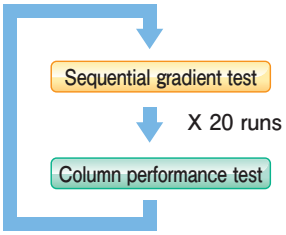

YMC CHIRAL Polysaccharide Derivatives Series provide good peak shapes on ionic and metal coordination compounds.

## Low Column Bleeding




YMC CHIRAL Amylose-SA and Cellulose-SB show remarkably reduced background signal under the typical gradient condition. This low column bleeding of those columns provides high sensitivity on LC/MS analysis due to the very low ion suppression as well as stable baseline. YMC CHIRAL Amylose-SA and Cellulose-SB offer excellent robustness on gradient analysis and highly sensitive analysis on LC/MS.

## Extended Packing Durability

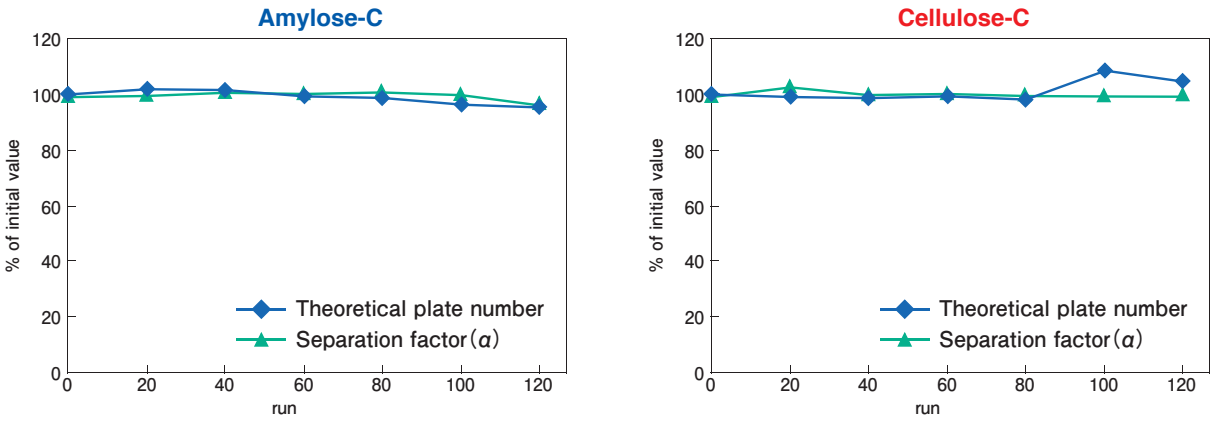



**Sequential gradient test**

Column : 5 μm, 250 X 4.6 mmI.D.
Eluent : A) *n*-hexane, B) ethanol
0-100%B (0-15 min)
Flow rate : 3.0 mL/min
Pressure : 10-30 MPa/run
Temperature : 37℃

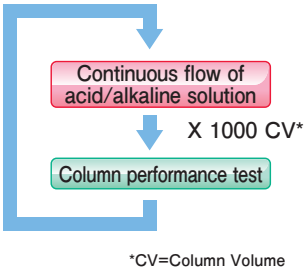
**Column performance test**

Column : 5 μm, 250 X 4.6 mmI.D.
Eluent : *n*-hexane/ethanol (90/10)
Flow rate : 1.0 mL/min
Temperature : 37℃
Detection : UV at 230 nm
Sample : *trans*-Stilbene oxide




YMC CHIRAL Polysaccharide Derivatives Series have outstanding packed bed stability provided by the use of high-strength super wide pore silica and innovative packing technology. The column efficiency and selectivity are maintained even after the sequential gradient tests at a high flow rate (three times higher than normal flow rate) and a high pressure (rapid pressure change). YMC CHIRAL Polysaccharide Derivatives Series are suitable for the case where one intends to shorten an analysis time, (re-)equilibration time and/or column cleaning time by increasing the flow rate. This feature is also effective when highly viscose solvent is needed to be used as a mobile phase on immobilized type columns.

## Wide Usable pH Range




*CV=Column Volume

**Continuous flow of acid/alkaline solution**

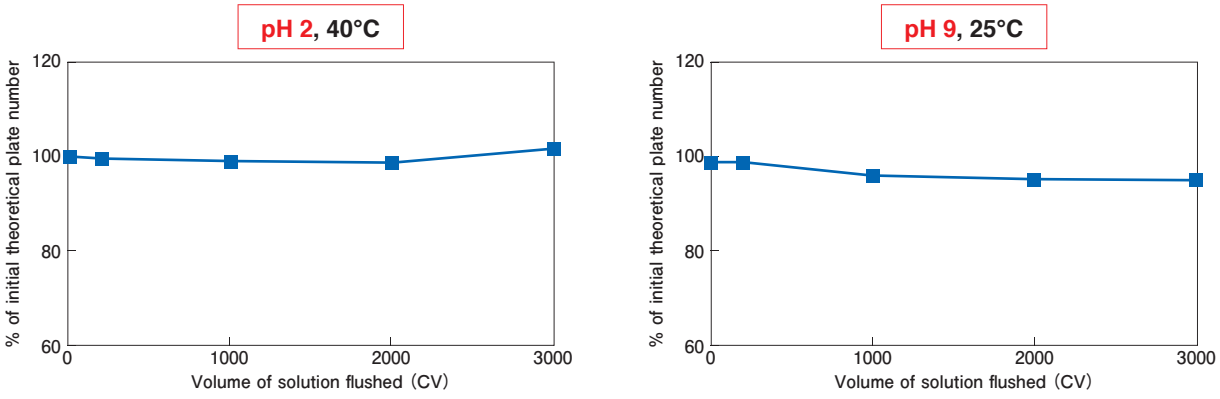
Column : YMC CHIRAL Cellulose-SB
5 μm, 50 X 4.6 mmI.D.
Eluent : Buffer/methanol (90/10)
Flow rate : 1.0 mL/min

[Acidic condition]
Buffer : 0.1% $H_3PO_4$ (pH 2)
Temperature : 40℃

[Basic condition]
Buffer : 20 mM $NH_4HCO_3$-DEA (pH 9)
Temperature : 25℃

**Column performance test**

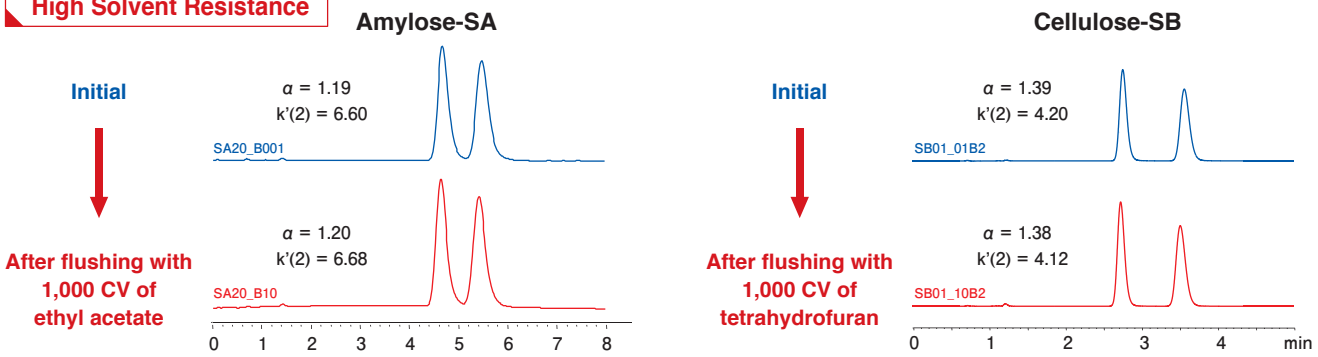
Column : YMC CHIRAL Cellulose-SB
5 μm, 50 X 4.6 mmI.D.
Eluent : acetonitrile/water (30/70)
Flow rate : 1.0 mL/min
Temperature : 25℃
Detection : UV at 254 nm
Sample : Benzoin




YMC CHIRAL Amylose-SA and Cellulose-SB have excellent chemical stability and can be used across a wide pH range. Addition of acid/amine in a mobile phase or use of buffer solution is an effective tool for improving peak shape and/or resolution.

# High Solvent Versatility (Immobilized Type)

## High Solvent Resistance




### Retention rate of initial column performance

(after flushing with 1,000CV of each solvent at 40℃)

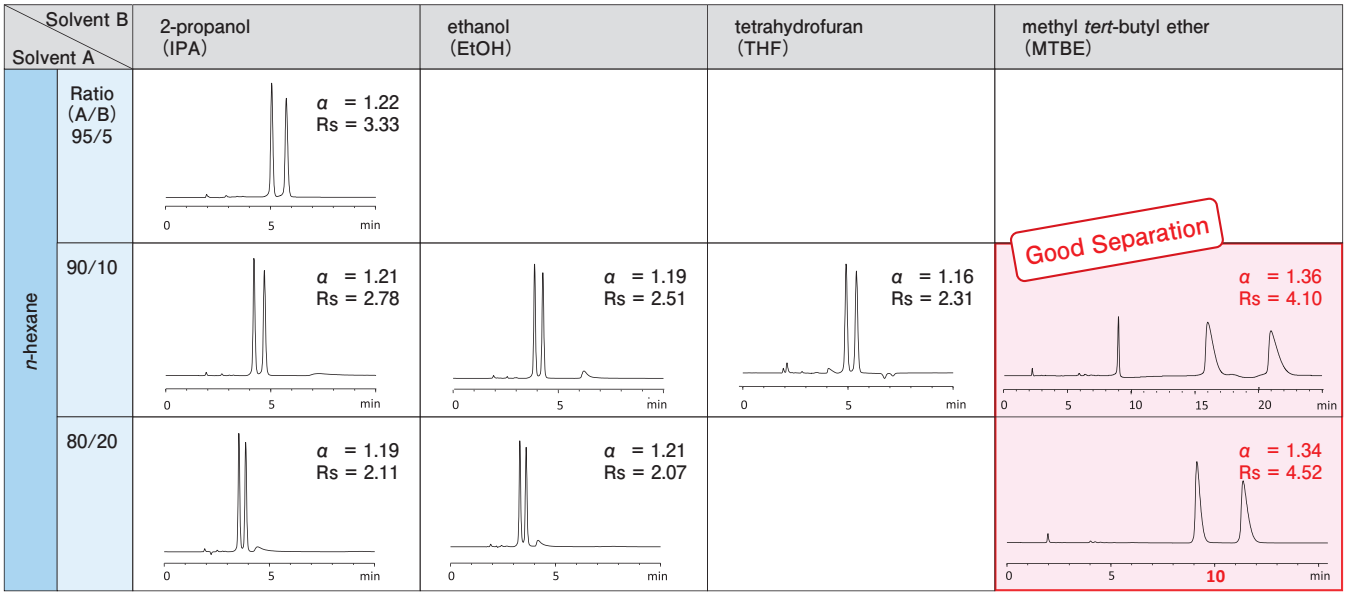
*CV=Column Volume

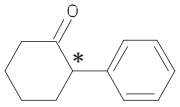
| | Amylose-SA | | Cellulose-SB | |
|---|---|---|---|---|
| | α | k'(2) | α | k'(2) |
| Ethyl acetate | 100.3% | 101.2% | 100.0% | 99.1% |
| Tetrahydrofuran | 100.0% | 100.0% | 99.3% | 98.0% |
| Dichloromethane | 100.3% | 100.6% | 101.3% | 99.6% |

Column : 5 μm, 50 X 4.6 mmI.D.
Eluent : *n*-hexane/2-propanol (95/5)
Flow rate : 1.0 mL/min
Temperature : 25℃
Sample : Benzoin

On YMC CHIRAL Amylose-SA and Cellulose-SB, the change in column performance after flushing with each solvent was less than 2%. They have high resistance to various solvents.

## Method Screening

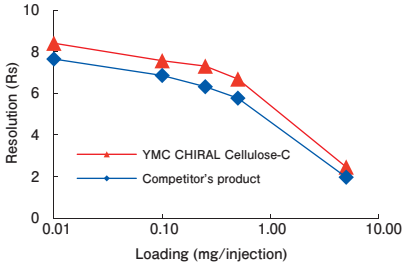
2-Phenylcyclohexanone

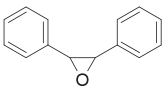
Column : YMC CHIRAL Cellulose-SB 5 μm, 150 X 3.0 mmI.D.
Flow rate : 0.425 mL/min
Detection : UV at 220 nm
Temperature : 25℃

The chiral method screening of 2-Phenylcyclohexanone on YMC CHIRAL Cellulose-SB is shown above. A mobile phase containing MTBE gave good separation. On YMC CHIRAL Amylose-SA and Cellulose-SB with high solvent versatility, chromatographers can freely choose the most suitable mobile phase by considering the solubility, resolution and loadability of target compound based on the purpose of separation (e.g. analytical or preparative).

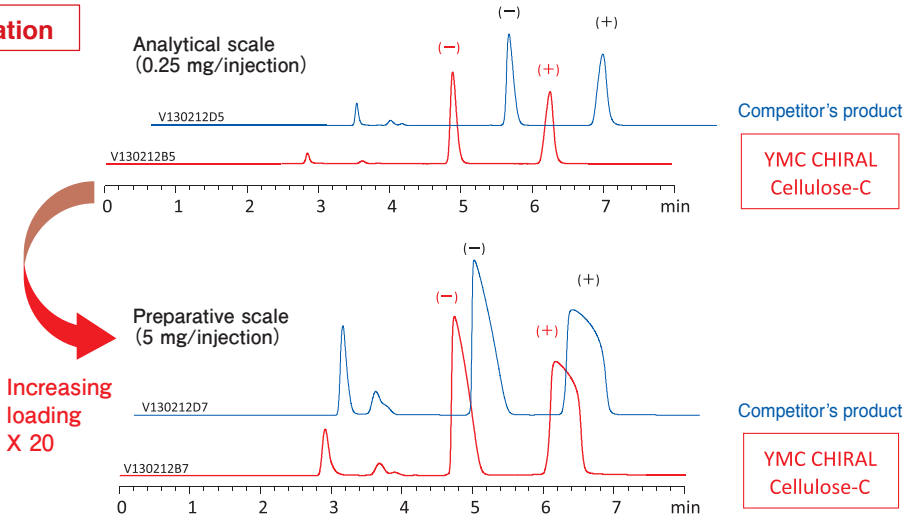
# Effective for Preparative Separation of Enantiomers

## Suitable for High-Loading Preparation



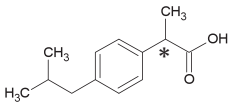
*trans*-Stilbene oxide




On both analytical and preparative separation, separation behavior of YMC CHIRAL Polysaccharide Derivatives Series is equivalent to that of the competitor's product.

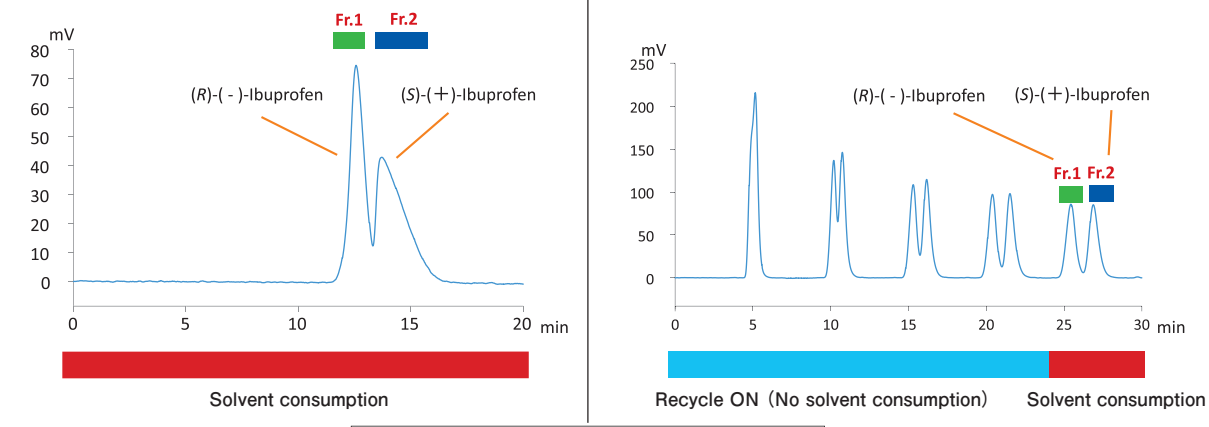
| | |
|---|---|
| Column | : 5 μm, 250 X 4.6 mmI.D. |
| Eluent | : *n*-hexane/ethanol (90/10) |
| Flow rate | : 1.0 mL/min |

## High Purity Purification Utilizing Recycling Preparation



Ibuprofen

| Single column separation | Recycle separation |
|---|---|
| ・50 mg Loading<br>・Each corresponding peak was collected separately as Fr. 1 and Fr. 2. | ・50 mg Loading<br>・Each corresponding peak was collected separately as Fr. 1 and Fr. 2 after several recycling runs. |
| Eluent : *n*-hexane/2-propanol/TFA (99/1/0.1) | Eluent : *n*-hexane/2-propanol/TFA (96/4/0.1) |




| | |
|---|---|
| Column | : YMC CHIRAL Cellulose-C 10 μm, 250 X 20 mmI.D. |
| Flow rate | : 20 mL/min |
| Detection | : UV at 265 nm |
| Injection | : 5 mL (10 mg/mL) |
| System | : LC-Forte/R |

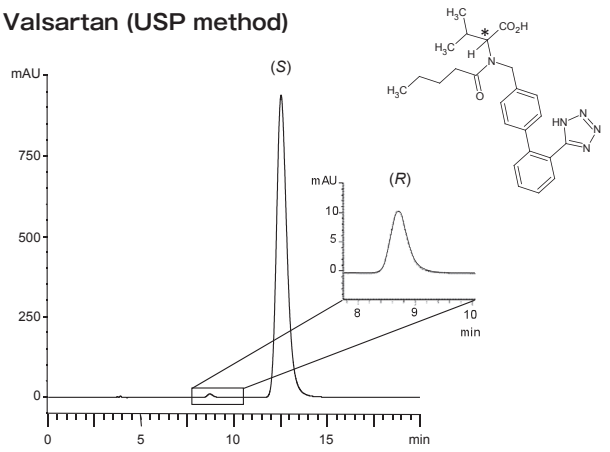
| | Single Column | Recycle |
|---|---|---|
| Enantiomeric purity (%ee)<br>Fr.1 (*R*)-(−)-Ibuprofen<br>Fr.2 (*S*)-(+)-Ibuprofen | <br>95.0<br>96.8 | <br>98.4<br>99.2 |
| Yield (%) | 84 | 95 |
| Solvent consumption (mL solvent/g product) | 9,523 | 1,276 |

Ibuprofen enantiomers were purified by utilizing recycling mode of multi preparative HPLC system, LC-Forte/R. Recycling chromatography is effective when method optimization of chiral isolation is difficult on single column separation. Recycling method offers high purity and high recovery purification. Furthermore, no solvent is consumed during recycling mode. It greatly contributes reduction of solvent consumption on purification.

LC-Forte/R

# Applications

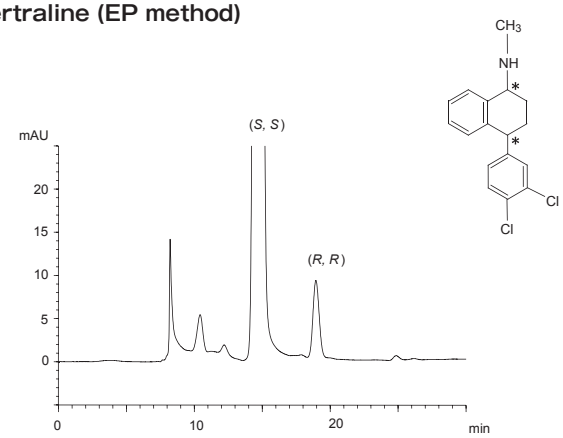
## Valsartan (USP method)




| | |
|---|---|
| Column | : YMC CHIRAL Cellulose-C 5 μm, 250 X 4.6 mmI.D. |
| Eluent | : *n*-hexane/2-propanol/TFA (85/15/0.1) |
| Flow rate | : 0.8 mL/min |
| Temperature | : 25℃ |
| Detection | : UV at 230 nm |

E130620B

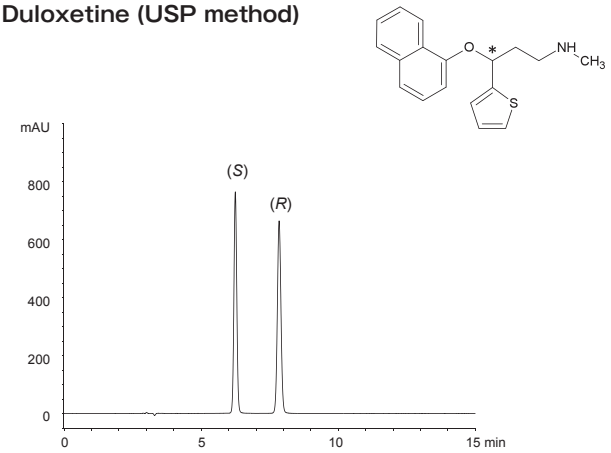
## Sertraline (EP method)




| | |
|---|---|
| Column | : YMC CHIRAL Amylose-C 5 μm, 250 X 4.6 mmI.D. |
| Eluent | : mixture*/*n*-hexane (70/30) |
| | **n*-hexane/2-propanol/diethylamine (975/25/1) |
| Flow rate | : 0.4 mL/min |
| Temperature | : 25℃ |
| Detection | : UV at 275 nm |

E131205C

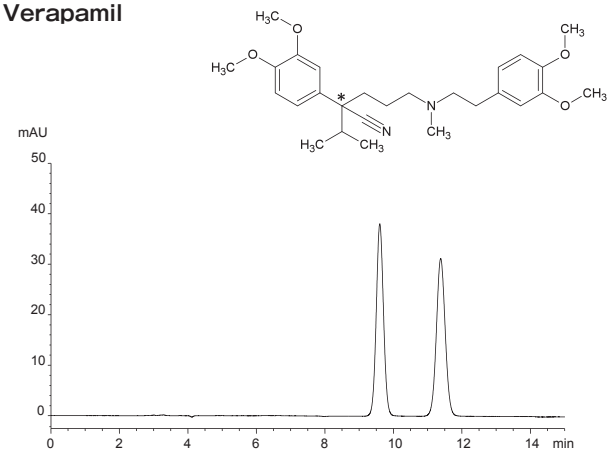
## Duloxetine (USP method)




| | |
|---|---|
| Column | : YMC CHIRAL Cellulose-C 5 μm, 250 X 4.6 mmI.D. |
| Eluent | : *n*-hexane/2-propanol/diethylamine (83/17/0.2) |
| Flow rate | : 1.0 mL/min |
| Temperature | : 40℃ |
| Detection | : UV at 230 nm |

F130930A

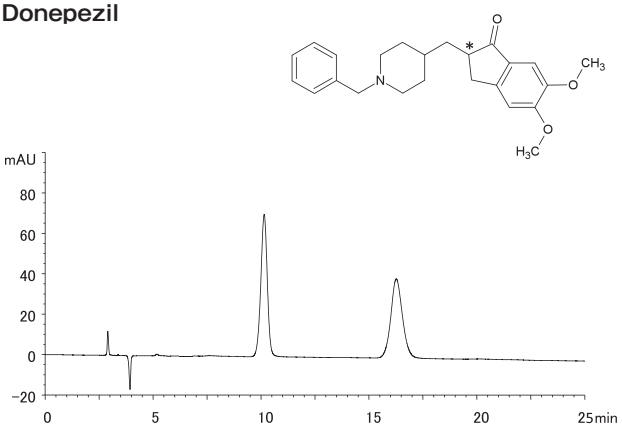
## Verapamil




| | |
|---|---|
| Column | : YMC CHIRAL Amylose-C 5 μm, 250 X 4.6 mmI.D. |
| Eluent | : *n*-hexane/2-propanol/diethylamine (90/10/0.1) |
| Flow rate | : 1.0 mL/min |
| Temperature | : 25℃ |
| Detection | : UV at 254 nm |

V130905D

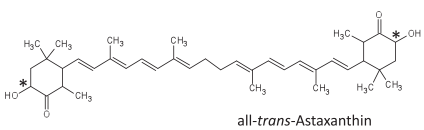
## Donepezil



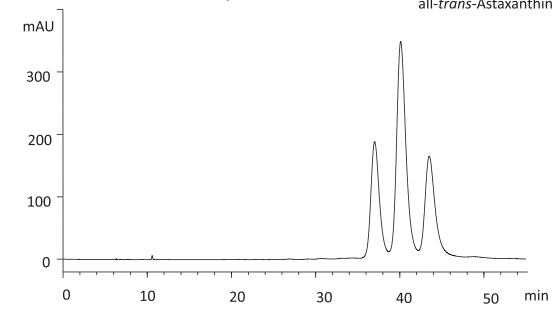

| | |
|---|---|
| Column | : YMC CHIRAL Amylose-SA 5 μm, 250 X 4.6 mmI.D. |
| Eluent | : *n*-hexane/2-propanol/diethylamine (80/20/0.1) |
| Flow rate | : 1.0 mL/min |
| Temperature | : 25℃ |
| Detection | : UV at 230 nm |

V140422B2

## Astaxanthin



all-*trans*-Astaxanthin




Courtesy of Fuji Chemical Industry Co., Ltd.

| | |
|---|---|
| Column | : YMC CHIRAL Cellulose-SB 5 μm, 250 X 4.6 mmI.D. |
| Eluent | : *n*-hexane/THF (85/15) |
| Flow rate | : 0.5 mL/min |
| Temperature | : 25℃ |
| Detection | : UV at 476 nm |

E140417B

# Ordering Information

## Columns

| Particle size (μm) | Column size inner diameter X length (mm) | Product number | | | |
|---|---|---|---|---|---|
| | | Coated type | | Immobilized type | |
| | | Amylose-C | Cellulose-C | Amylose-SA | Cellulose-SB |
| 5 | 4.6 X 150 | KAN99S05-1546WT | KCN99S05-1546WT | KSA99S05-1546WT | KSB99S05-1546WT |
| | 4.6 X 250 | KAN99S05-2546WT | KCN99S05-2546WT | KSA99S05-2546WT | KSB99S05-2546WT |
| | 10 X 250 | KAN99S05-2510WT | KCN99S05-2510WT | KSA99S05-2510WT | KSB99S05-2510WT |
| | 20 X 250 | KAN99S05-2520WX | KCN99S05-2520WX | KSA99S05-2520WX | KSB99S05-2520WX |

Please inquire us other than those listed above.

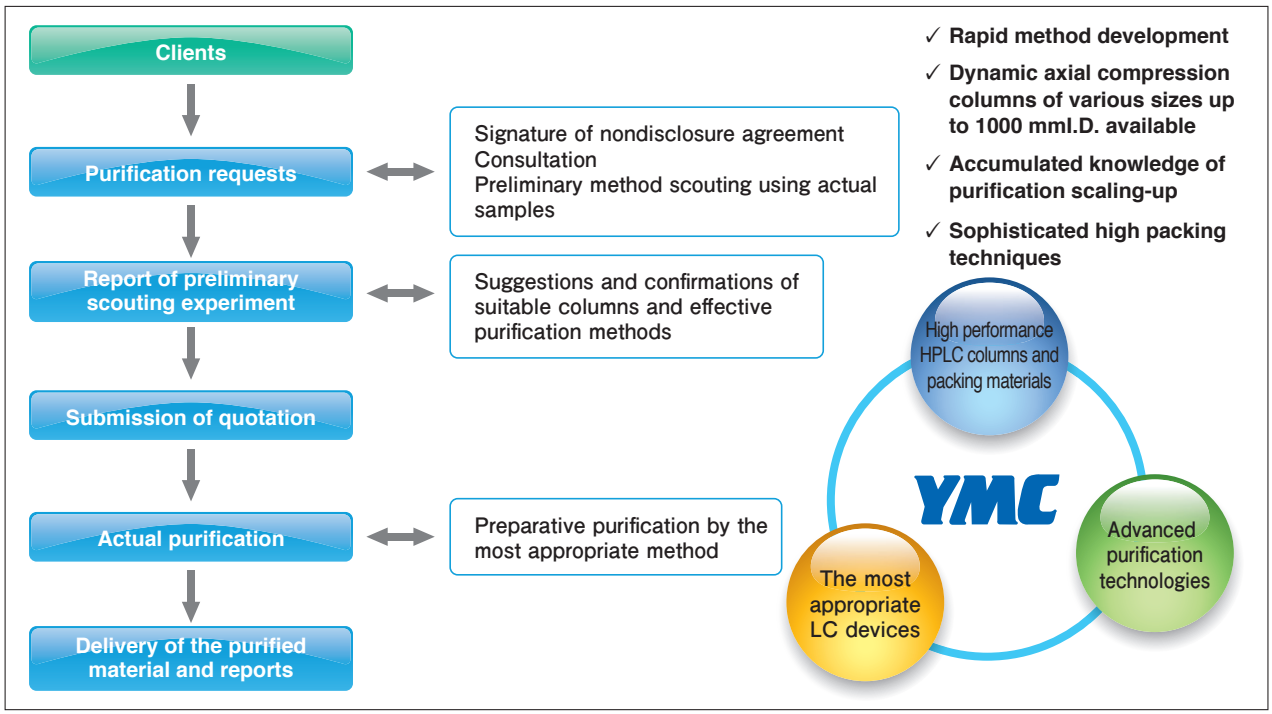
## Packing Materials

| Particle size (μm) | Product number | | | |
|---|---|---|---|---|
| | Coated type | | Immobilized type | |
| | Amylose-C | Cellulose-C | Amylose-SA | Cellulose-SB |
| 5 | KAN99S05 | KCN99S05 | KSA99S05 | KSB99S05 |
| 10 | KAN99S11 | KCN99S11 | KSA99S11 | KSB99S11 |
| 20 | KAN99S21 | KCN99S21 | KSA99S21 | KSB99S21 |

Please inquire us other than those listed above.

# Contract Purification of Chiral Compounds is Now Available

YMC CO., LTD. Chiral Technologies Laboratory was established in November, 2013 and YMC has started contract purification of chiral compounds. Following the steps below, YMC is confident that highly-purified chiral compounds are delivered with high credibility and speed. YMC's contract purification service enables you to accelerate the realization of your research and development.




## Worldwide Availability

**YMC America, Inc.**
www.ymcamerica.com

**YMC Europe GmbH**
www.ymc-europe.com

**YMC India Pvt.Ltd.**
www.ymcindia.com

**YMC Korea Co., Ltd.**
www.ymckorea.com

**YMC Shanghai Rep. Office**
www.ymcchina.com

**YMC Singapore Tradelinks Pte. Ltd.**
www.ymc.sg

**YMC Taiwan Co.,Ltd.**
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Kyoto,600-8106,Japan
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